Commercial Fisheries Abstracts

a monthly summary of important developments for the fishery industries

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12(10)

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Vol. 12 No. 10 October 1959

Fish and Wildlife Service
U.S. Department of the Interior
Washington D.C.

UNITED STATES
DEPARTMENT OF THE INTERIOR
FRED A. SEATON, SECRETARY

FISH AND WILDLIFE SERVICE
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Commercial Fisheries Abstracts

DIVISION OF INDUSTRIAL RESEARCH AND SERVICES
BUREAU OF COMMERCIAL FISHERIES

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0 General and theoretical
1 Fish by species
2 Fresh fish
3 Preserved fish
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6 Fishery byproducts
7 Analytical Methods
8 Composition
9 Miscellaneous

Use of funds for printing this publication has been approved by the Director of the Bureau of the Budget November 23, 1956.

0.321 STUDIES ON THE PROTEINS OF FISH SKELETAL MUSCLE
5. MOLECULAR WEIGHT AND SHAPE OF COD FIBRILLAR PROTEINS

Connell, J. J. (Torry Research Station, Aberdeen, Scotland)
The Biochemical Journal 70, 81-91 (1958) (Reprinted)
D.S.I.R. Food Investigation Memoir No. 1181

Introduction.--Unaggregated myosin is present in extracts of cod skeletal muscle, and attempts to isolate the monomeric protein from the extracts with precipitation by dilution failed because it aggregated spontaneously. Measurements of the molecular weight and shape of unaggregated cod myosin have been undertaken to decide whether some feature of these parameters could explain the unusual behavior of the fish protein. Monodisperse cod myosin has been prepared by separating it in the preparative ultracentrifuge after the dissociation of actomyosin with adenosine triphosphate (ATP) or sodium pyrophosphate at 0°C.

Sedimentation of cod myosin.--Within the range 0° to 7°C., values of the corrected sedimentation coefficient (S_0) of cod myosin are consistent and show no systematic variation with temperature, type of muscle (frozen or fresh), or type of dissociating reagent (ATP or pyrophosphate). In the equation $S = S_0kc$, application of the method of least squares leads to the following values: $S_0 = 6.43 \times 10^{-13}$ (standard error 0.08×10^{-13}); $k = 3.18 \times 10^{-13}$ (standard deviation 0.39×10^{-13}), correlation coefficient 0.89; and c = the initial protein concentration in grams per 100 milliliters (g./100 ml.).

Diffusion of cod myosin.--The diffusion coefficient of cod myosin was found to vary only slightly with concentration between 0.19 and 0.40 g./100 ml., with the mean value of six determinations being 1.10×10^{-7} cm.^{2} sec.$^{-1}$ (standard error 0.05×10^{-7}). The shape of the diffusion curve of the final photograph of one run deviated from ideality in showing considerable sharpening but no skewing.

(over)

 ABSTRACTER: Herman S. Groninger

0.38 OBSERVATIONS ON THE CATALYZED HYDROLYSIS OF p-NITROPHENYL ACETATE BY PEPTIDES OF HISTIDINE AND METHYLHISTIDINE

Lukton, A. and Olcott, H. S. (Institute of Marine Resources, University of California, Berkeley)
Biochim. Biophys. Acta 32, 267-268 (1959) (Reprinted)

Because imidazole groups are thought to be the site of action of some hydrolytic enzymes, several investigations have been made of the catalytic hydrolysis of esters by simple imidazole compounds. The rates of hydrolysis observed during the investigations suggest a possible function for the histidine and other imidazole compounds that occur in some tissues in relatively large amounts. The skeletal muscle of tuna, for example, may contain as much as 50 micromoles of histidine and 40 micromoles of anserine per gram of wet tissue. In the present study, carnosine, anserine, I-methylhistidine, histidylhistidine, and β-aspartylhistidine were compared to histidine in regard to their ability to accelerate the hydrolysis of p-nitrophenyl acetate (NPA) at pH 6.2.

The results of the investigations are shown in table 1 (see over). With two exceptions, the degree of effectiveness was equal to that expected from the general theory of basic catalysis; that is, the log of the rate of hydrolysis is proportional to the pK value (dissociation constant) of the imidazole group. The values fell on a straight line except for those of β-aspartylhistidine and histidylhistidine. Because the effects of the various polar groups are not known, it is not possible to account for these discrepancies.

An investigation also was conducted on the inhibition of the catalytic effect of histidine and I-methylhistidine by Cu^{++}, Zn^{++}, Ni^{++}, Co^{++}, and Mn^{++}. These experiments were conducted at pH 7.15 in 0.05 M veronal buffer. When metal salts and imidazole were in equimolar proportion (0.0003 M), Cu^{++} effectively inhibited both histidine and I-methylhistidine, to the extent of 94 and 91 percent, respectively. Zn^{++} and Ni^{++} were more effective as inhibitors for histidine, 94 and 100 percent,

(over)

 ABSTRACTER: Kathryn L. Osterhaug

COD PROTEIN STUDIES

ENZYME CATALYSTS

1.87 THE ROLE OF HOLDING POUNDS IN THE MAINE LOBSTER INDUSTRY

Dow, Robert L.; Harriman, Donald M.; and Scattergood, Leslie W.
Commercial Fisheries Review 21, 1-14 (May 1959)

Most American lobsters are sold alive. The industry therefore has had to develop means of storing the lobsters from the time they are caught until they enter the retail trade. Lobster pounds play an important role in these storage activities.

Yearly and seasonal fluctuations in lobster landings make it necessary to store large quantities of lobsters. The reasons for the seasonal fluctuations are based on several factors. Canada, for instance, has a system of closed seasons that allows lobster fishing principally during months when live lobsters are able to withstand shipment to distant markets and when the cooked lobsters produce a good yield of meat for the canneries. Although there are no closed seasons in Maine except around Monhegan Island, lobsters from Maine waters are most easily caught shortly after moulting; therefore, most of them are caught during the season from July to October when they are not particularly hard-shelled and consequently are difficult to ship to market.

Lobster-holding facilities.--Live-lobster storage facilities designed to hold lobsters while they are soft shelled and difficult to ship are in operation along the Maine Coast from Kittery to Eastport. Three methods of live-lobster storage currently are in use: (1) tidal pounds for long-term storage, (2) circulating sea-water holding tanks for the preparation of daily shipments to market or for temporary short-term storage, and (3) cars and crates anchored near docks, floats, or other auxiliary and short-term storage. Wet-well smacks also are employed for temporary storage of live lobsters at the buying site.

Tidal pounds.--A lobster pound is an enclosed area in which lobsters may be stored that is

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 ABSTRACTER: Kathryn L. Osterhaug

LOBSTER HOLDING POUNDS

2.118 RESEARCH ON CHILLING AND FREEZING OF FISH (HVOR LANGT ER FORSKNINGEN NÅET VEDRÖRENDE KÖLING OG FRYSNING AF FISK?)

Bramsnaes, Af. F. (Fiskeriministeriets Forsögslaboratorium, Copenhagen, Denmark)
Saetryk af Kulde Dansk Köleteknisk Tidsskrift 12, No. 6, 61-64 (1958) and 13, No. 1, 5-9 (1959)

Summary.--Many experiments, both small and large scale, have shown a great influence of temperature on the keeping quality of fresh fish stored between 0° and 10°C. These results have gradually led to improved handling of fish on board and on shore. In Scandinavia, there has been an increase, in recent years, in the amounts of ice used. Insulation of fish rooms in steel boats is helpful and now widely employed. Mechanical refrigeration of such rooms does not, on the whole, influence the temperature of the fish. On the other hand, it may be of value in saving ice and in keeping the ice in a condition in which it is easy to handle.

Distant-water trawlers have only a short fishing period compared with the length of time spent on outward and homeward journeys. One possible solution is a prolongation of the storage life of iced fish by adding preservatives. Antibiotics have shown definite possibilities. The health aspect is now being studied. Another solution is freezing at sea of the whole or part of the catch. Freezers will require space. However, by using the latest design of propulsion machinery, it should be possible to reduce space occupied by such machinery and fuel and to increase space and capital available for processing plants and stowage of fish.

The Fair Free and the Pushkin class operations with extensive use of mechanized handling of fish have been successful with regard to production of fillets on board.

Fatty eviscerated fish packed in retail cartons present a serious problem of rancidity. Danish

(over)

 Author's summary

FISH REFRIGERATION

0.38

respectively. Co^{++} inhibited only histidine (92 percent), and Mn^{++} had no effect on either substance. Co^{++} also had no effect on carnosine or anserine.

Table 1.--Effect of imidazole compounds on rate of hydrolysis of p-nitrophenyl acetate.

3 μmoles imidazole compound, 25 μmoles p-nitrophenyl acetate in 0.2 ml. acetone, 0.067 M phosphate buffer, pH 6.2, total volume, 10 ml. Nitrophenol liberation calculated from linear rate of increase of absorbance at 402 mμ, at 30°.

Imidazole compound	pK (Im)*	Rate of liberation of nitrophenol μmoles/1/min.	Relative rate**
None	---	1.0	---
Histidylhistidine	5.60, 6.80	6.0	2.1
Histidine	6.00	3.3	1.0
I-Methylhistidine	6.48	5.8	2.0
Carnosine	6.83	7.3	2.7
β-Aspartylhistidine	6.93	3.4	1.0
Anserine	7.04	9.3	3.6

* pK values from Cohn and Edsall (1943), 25°. The pK of the imidazole group of β-aspartylhistidine was determined by Greenstein and Klemperer (1939), 38°.
** Compared to histidine after subtraction of the blank.

Koltun and Gurd (1958) have reported that the Zn^{++} and Cu^{++} complexes of imidazole were ineffective catalysts for NPA hydrolysis. These observations therefore suggest that copper forms poorly dissociable complexes with the imidazole group of both histidine and I-methylhistidine, that the complexes of Zn^{++} and Ni^{++} with the histidine imidazole group are stronger than with that of I-methylhistidine, and that Co^{++} forms a complex with the histidine imidazole group but not with that of I-methylhistidine, carnosine, or anserine.

2.118

experiments with trout show that very low temperatures will delay considerably the onset of rancidity. Such low temperatures, however, are not always obtainable under commercial conditions, and experiments have shown that dipping the fish in ascorbic acid solution prolonged the storage life, without affecting the taste adversely.

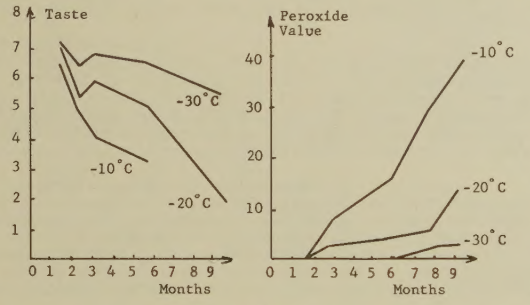

Figure 5.--Influence of storage temperature on frozen eviscerated trout Packed in retail cartons. The quality was determined by a taste panel and by peroxide values.

0.321

Partial specific volume of cod myosin.--A value of 0.735 at 20° C. and a mean concentration of 0.34 g./100 ml. were found with Kraemer's equation number 115. The value at infinite dilution is probably slightly less than 0.735 and in close agreement with a value of 0.728 for rabbit myosin at 26°. A value of 0.730 at 20° has been used in the calculation of sedimentation coefficient and molecular weight.

Molecular weight and frictional coefficient of cod myosin from sedimentation and diffusion results.--Insertion of the values for sedimentation coefficient and diffusion coefficient, determined from a stationary boundary, into the Svedberg equation gives a value of 530,000 for the molecular weight with a standard deviation of about 30,000. The frictional coefficient is 3.62. The mean of four molecular weight determinations made by the Archibald procedure at 1.4° to 6.4° C. and concentrations of 0.23 to 0.44 g./100 ml. was 590,000 with a standard deviation of 50,000. The molecular weight calculated from successive exposures showed no trend with time and indicated that the preparations were essentially monodisperse.

Intrinsic viscosity and optical rotation of cod myosin.--Values of $\eta_{sp.}/c$ were plotted against c for four preparations and extrapolated to infinite dilution to give an intrinsic viscosity of 0.80 (standard deviation 0.05). $\eta_{sp.}$ and c are, respectively, the specific viscosity and concentration in g./100 ml. This value corresponds to axial ratios of 58 and 50 for prolate ellipsoids of revolution with 10 and 30 percent of hydration, respectively. One preparation with a protein concentration of 0.32 g./100 ml. gave an optical rotation of $[\alpha]_D^{23} = 29°$ in KCl-phosphate buffer with an ionic strength of 0.5. The same preparation with a protein concentration of 0.17 g./100 ml. or the concentration of 8 M urea gave a value of $[\alpha]_D^{23} = 104°$ in KCl-phosphate buffer with an ionic strength of 0.5.

Sedimentation coefficient, molecular weight, and frictional ratio of cod G-actin.--The extrapolated sedimentation coefficient, which is about 3.3×10^{-13}, together with the diffusion coefficient of cod G-actin, which is 2.3×10^{-7} cm.^{2} sec.$^{-1}$, gives a molecular weight of about 130,000 and a frictional ratio of 2.7. If 30 percent hydration is assumed, the latter value corresponds to an axial ratio of 25 for a prolate ellipsoid of revolution.

1.87 (Cross Reference: 2.40)

flushed by tidal water. The most common method of constructing a pound is to place a dam across the mouth of a small cove. The top of the dam is several feet below high-water level, and the water flushing over the dam provides the needed circulation.

Lobsters are removed from the pound by dragging seines or modified beam trawls along the bottom. Often pounds can be completely drained during low spring tides so that the last of the lobsters can be collected.

Problems of lobster pounds.--A number of factors affect the survival of lobsters held in pounds. These factors include (1) prevailing water temperatures, (2) salinity fluctuations, (3) degree of mixing of impounded water with outside water, (4) volume of enclosed water, (5) area of bottom, and (6) infection with disease. Although these factors are recognized, their effects cannot be predicted with precision.

Lobsters held in pounds usually are fed. If not fed, they lose weight and cannibalism becomes a problem. The skeleton left from filleted redfish (Sebastes) is the most popular food. The amount of food offered is critical because the putrefaction resulting from an excess consumes valuable oxygen and releases toxic substances.

An aspect of lobster-pound operation that requires further work is the role of pounds in the conditioning of lobsters. A study of pound practices designed to promote the hardening of shell and building of meat content simultaneously is needed.

1.89 TECHNICAL NOTE NO. 53.--UTILIZATION OF SEA CUCUMBERS (HOLOTHURIANS) AS FOOD

Dassow, John A. (Bureau of Commercial Fisheries, Seattle 2, Washington)
Commercial Fisheries Review 21, 15-16 (May 1959)

The sea cucumber is a simple animal, tube-like in form, in which the skin and longitudinal muscle surround the viscera. The front end of the animal is easily identified by the tentacles that sweep the water and food from the bottom of the sea.

Sea cucumbers may be gathered during any season of the year in the North Pacific region; however, Alaskans claim that the quality of the sea cucumber is poor during the summer. After they have been gathered, sea cucumbers are placed in a tub containing a small amount of pure fresh sea water and are allowed to contract. They are then cleaned and eviscerated by cutting off one or both ends, splitting down the side, and scraping or flushing away the visceral material. The remainder of the animal can be handled in either of two ways:

1. Most people use only the longitudinal white muscle, which looks and tastes like sliced clam meats of excellent quality after it has been separated from the outer skin. The eviscerated sea cucumber should be washed with fresh sea water, and the white muscle should be peeled or cut away from the skin in thin strips. The muscle can then be used fresh, or it can be frozen or canned.

(a) Fresh: Cook the thin white strips of muscle and use them in the same way as raw clam are used. The muscle, if simmered in a small amount of salted water for a few minutes, for example, can be minced easily and used to make chowder, fritters, and sea-cucumber dip, employing the same ingredients as those of clam dip--namely, fresh cream, cream cheese, and seasonings.

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 ABSTRACTER: Kathryn L. Osterhaug

2.1471 SURFACE AND MID-WATER TRAWL

Aalberg, A. F.
Kalomiehin Viesti (Kotka, Finland), Nos. 1 and 2 (Feb. 6 and March 16, 1958)
World Fisheries Abstracts 10, 11-12 (January-February 1959)

A small surface and mid-water trawl for catching small Baltic herring has been constructed in Finland in recent years. This trawl is used with two small open boats, each with a 15 h.p. engine. It is felt that it can be used in many areas, e.g., for catching dispersed sardines in tropical waters and elsewhere. Suitable boats are available nearly everywhere and, therefore, the introduction of this trawl does not involve any great capital investment.

The catches have been good in Finland (200 to 800 kg. or 440 to 1,760 lb./night) (Pitkanen 1957), and good catches have been made with this trawl even when the Baltic herrings have been dispersed and the use of gill nets has been unprofitable. The numbers of this trawl are rapidly increasing in Finland and it is felt that this small trawl will soon outrule gill nets entirely in Finland.

Its construction is shown in the illus. overleaf. Untwistable Manila or hemp warps are used. A certain amount of experience is necessary for handling this trawl. It is set out by one boat and the end of the bridle is handed over to another boat. During the trawling, 50 to 80 m. (164 to 262 ft.) distance is kept between the boats. As the trawling is done at night, the boats must have lights to see to maintain the distance and operate. The warps are pulled in with simple hand winches while moving and then one boat hands the bridle over to the other for pulling in the trawl.

The trawl can most successfully be used during the night when herrings are closer to the surface. Echo sounders are helpful for location of shoals for use of this trawl.

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 ABSTRACTER: Taivo Laevastu

2.1121 THE ELECTRIC MID-WATER TRAWL

Russell, Jay
Maine Coast Fisherman 13, 12 (June 1959)

The efficiency of the mid-water trawl could be improved by increasing the area of its mouth opening and by towing it at a faster speed. The present mid-water trawl is restricted to small size and to slow speed under tow by the resistance of the great quantity of netting needed in its construction.

To overcome this difficulty, Jakob Gudjohnsen, an Icelandic electrical engineer, has developed the idea of an electric mid-water trawl that would do away with standard netting for much of the trawl. A series of widely spaced electrical conductors would be substituted for much of the netting. An electrical field set up across the conductors would prevent escapement of the fish, and netting would be needed only in the after belly and cod end of the trawl. The electrical conductors would offer only a fraction of the hydrodynamic resistance offered by netting. See diagram, over.

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 ABSTRACTER: Kathryn L. Osterhaug

2.5 SOME ASPECTS OF THE RAIL TRANSPORT OF WET FISH

Nicol, D. L. (Humber Laboratory, Department of Scientific and Industrial Research, Hull, England)
Modern Refrigeration 62, 451-454 (May 1959)

This paper describes work carried out by the D.S.I.R. to elucidate some of the problems concerned with the rail transport of fresh fish in ice.

The question of handling fish from the time they are caught until they are eaten must be viewed as a whole, for no one link in the chain of distribution can be assessed apart from the others. Some attention must therefore be given to the temperature history of the fish before they are loaded into the railway car.

The greater part of the fish eaten in England are caught by middle- and distant-water trawlers. The fish are gutted at sea and stowed in ice. At the time of landing, the fish will have been kept in this way for periods varying from 2 days to 2 weeks, and their temperature will be within a degree or two of 32° F.

Fish generally are unloaded between midnight and 8 a.m., and some of them remain without ice until the afternoon. During this time, the temperature of the fish may rise to the region of 40° to 45° F. In addition, the fish that are filleted are washed in water at the temperature of the mains. Most of the fillets are at temperatures close to 50° F.

The ice in which the fillets are packed for transport to market must not merely deal with heat entering the box but must also cool the load of fillets from 50° to 32° F. Wet fish are poor conductors of heat, and a large mass of fish will cool slowly.

Attention has been given to the problems of transient conduction in a mass of fillets, and researchers have demonstrated that the standard methods for the calculation of temperature distribution under these conditions give results that are in good agreement with the observed values. An example of commercial practice is the 2-stone box in which there is a layer of fillets 4 inches deep with a layer of ice on top. The rate of cooling of such fillets, assuming a uniform initial temperature of

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 ABSTRACTER: Kathryn L. Osterhaug

PREPARATION OF SEA CUCUMBERS

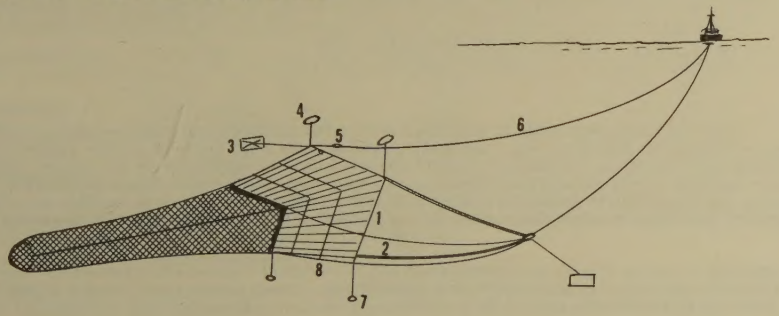
ELECTRIC TRAWL

FINNISH TRAWLS

RAIL TRANSPORT OF FRESH FISH

2.1121 (Cross Reference: 2.143)

DIAGRAMMATIC SKETCH of the electric mid-water trawl, which eliminates much of the standard netting. Major features of the Gudjohnsen trawl are (1) flexible wire electrodes, (2) insulated multicore, (3) paravanes, (4) floats, (5) clamping arrangements, (6) multicore towing cables, (7) weights, and (8) noncon lines.



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50° F., is shown in figure 1.

Ice is sometimes placed at both top and bottom of the box. Although this takes more time in packing, it improves the rate of cooling (see figure 2).

Ice at the ports is not expensive. The liberal use of ice in the proper places is the most important factor in getting good-quality fish to the consumer.

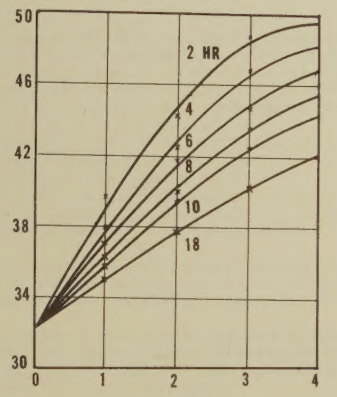

Fig. 1 - Temperature distribution in a 4-inch layer of fillets, initially at 50° F., iced on the top only.

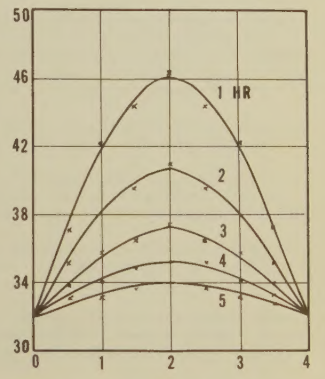

Fig. 2 - Temperature distribution in a 4-inch layer of fillets as in Fig. 1 but iced top and bottom.

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(b) Frozen: Pack the muscle in small jars or cans, flood it with a 2-percent salt solution (about 1 tablespoon of salt per quart of water), close or seam it, freeze, and store at 0° C. The meats will keep for 3 or 4 months in good condition.

(c) Canned: Use a process similar to that employed with minced razor clams. Fill the minced sea cucumber in brine into ½-pound cans (307x113) with c-enamel, vacuum-seam, process for 35 minutes at 240° F. (10 pounds steam pressure), and water cool. No data are available on the yield of meat per weight of whole animal, but it is known to be low.

2. Indians of the Northwest Coast do not remove the skin, but cook the whole eviscerated animal by boiling it for 20 minutes or by roasting it in a fire pit.

The sea cucumber can also be dried. This product is called trepang in the Orient.

2.1471

A - Boat - 15 h.p.

B - Warp

C - Upper bridle

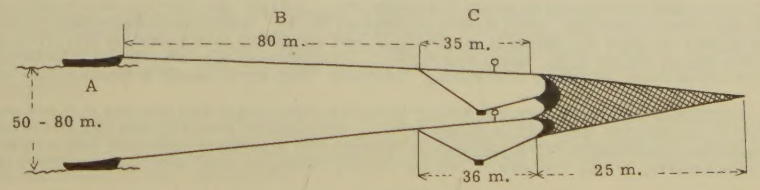

Diagram of the Finnish trawl

2.9 NUTRITIVE VALUE OF FISH FROM MICHIGAN WATERS

Ingalls, Ruth L.; Klocke, Jessie Finley; Rafferty, Joan Plummer; Greensmith, R. Ellen; Chang, Miranda Li; Tack, Peter I.; and Ohlson, Margaret A.
Technical Bulletin 219, Michigan State College, Agricultural Experiment Station, 24 pp. (May 1950) (East Lansing)

Nine species of fresh-water fish from the lakes of Michigan were analyzed for thiamin, riboflavin, niacin, seven amino acids, nitrogen, total ash, solids, and phosphorus. The effects of preservation methods, cooking procedures, environment and season on the vitamin and amino acid content of the fish also were studied.

Comparison with beef muscle showed that, in general, fish and beef contained a similar amount of the three vitamins analyzed. Some samples of herring were very high in niacin. The thiamin content of burbot was over half the amount found in pork. The amino acid content of the fish protein was comparable to beef protein except in lysine. The lysine content of fish protein was a third higher than the lysine in beef protein.

There was a species difference in niacin, in thiamin, and in riboflavin content. The differences in percentage of amino acid in the fish protein of the nine species was not significant. There was, however, a species difference in amino acid content of fish tissue, which was related to differences in percentage of moisture and fat.

Frozen storage did not alter the nutritive value of the fish significantly. There was no significant loss in niacin, riboflavin, or thiamin during periods of frozen storage from 2½ to 11 months. The percentages of the seven amino acids in the fish protein were not changed during 4 months of frozen storage.

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 Authors' summary

3.19 EXPERIMENTS ON THE IRRADIATION OF FISH WITH 4 MEV CATHODE RAYS AND COBALT GAMMA RAYS

Shewan, J. M. and Liston, J. (Torry Research Station, Aberdeen, Scotland)
Second United Nations International Conference on the Peaceful Uses of Atomic Energy, 16 pp. (June 3, 1958)
D. S. I. R. Food Investigation Memoir No. 1204

Irradiation appears to have three effects on the bacterial population of fish: (1) a bactericidal one, (2) a bacteriostatic one, and (3) a devitalizing one. The present paper reports the results of experiments to determine (a) the immediate effect of irradiation on flavor and (b) the preservative effect of irradiation during the storage of the fish.

Effect of irradiation on flavor.--Unskinned fillets of haddock, cod, ling, lemon sole, mackerel, herring, and kipper were packed in cans with a minimum of head space and in an atmosphere of nitrogen. They then were frozen and held at -20° C. for 3 or 4 days before they were irradiated. All of the samples were irradiated at 0.25, 0.5, 1.0, and 3.5 x 10^6 rads using a 4 Mev linear accelerator. The samples were thawed before irradiation and then were refrozen and held at -20° C. until they were tested.

All samples, plus untreated controls, were examined both raw and cooked by a trained panel. The scales used for the raw odor and the cooked flavor each ranged from 10 for newly caught fish to 1 for putrid fish.

The results of the evaluations by the panels of judges indicate that doses higher than 2 to 3 x 10^6 rads produce such serious deterioration in flavor that the resulting product is inedible. The fat species, including herring and mackerel, are affected more by irradiation than are the lean fish.

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 ABSTRACTER: Kathryn L. Osterhaug

3.12 TECHNICAL ASPECTS OF THE COMMERCIAL USE OF ANTI-MICROBIAL CHEMICALS AS FOOD PRESERVATIVES

Ingram, M. (University of Cambridge, England)
Chemistry and Industry No. 18, 552-557 (May 2, 1959)

Introduction.--Preservatives now in use in Britain include benzoates, sulphites, and a nitrite. Additional preservatives that have some prospect of becoming usable in Britain are propionic and sorbic acids.

Preservatives as weak acids.--All of the above-mentioned preservatives are weak acids or their derivatives, and they probably are effective primarily in the molecular form of the undissociated acid. If the effective unit is the undissociated molecule, the amount of preservative needed to produce a given effect depends on the pH of the food. As a rule, increase of one unit in pH will require a ten-fold increase in the total quantity of preservative to get an equal effect. The number of undissociated molecules and the preservative effect will almost be eliminated as the pH of the system approaches two units more than the pK (dissociation constant) of the acid. Acids with a relatively high dissociation constant, such as salicylic acid, are useful only in highly acid foods; whereas a very weak acid of low dissociation or high pK, such as dehydroacetate or boric acid, is preferrable for neutral food. Unfortunately, these acids appear to be toxic.

Benzoic acid.--Benzoic acid and benzoates are preservatives that have little flavor or odor even in concentrations of 600 p.p.m. and are not volatile. Benzoic acid has the disadvantage of being a rather strong acid with a dissociation constant of about 6 x 10^{-5} or a pK of 4.2. Small concentrations of benzoate in solutions less acid than pH 5 are ineffective. British regulations permit a maximum of 600 p.p.m. of benzoate, which is inadequate. Canadian and U. S. regulations permit 1000 p.p.m. of benzoic acid, which at a pH below 3, should suffice to inhibit even yeasts.

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 ABSTRACTER: Martin Heerdt

3.239 FREEZING AND COLD-STORAGE

Anonymous
Food Investigation 1957, Report of the Food Investigation Board (Great Britain), pp. 10-12 (1958) (London)

Effect of ice crystals on the fine structure of fish muscle.--The deoxyribose nucleic acid (DNA) method was used to assess the relative damage caused by the formation of ice in cod fillets during freezing from one side only. If the times for the centers of the thickest parts of cod fillets to cool from 32° to 23° F. were about 25, 80, and 250 minutes, muscle cells were greatly damaged. Further investigation has suggested how the ice caused this damage.

If freezing takes about 25 minutes, ice is found to have formed inside the cells in two to four long columns lying parallel with the cell walls. Cell damage or rupture is thought to occur as the result of uneven stresses on the cell wall. This stress is caused by the expansion of the water as it freezes to form relatively few large crystals that are situated near the surface of the cell.

If the freezing time is about 80 minutes, the change-over from intracellular to extracellular ice formation is about to take place. Under these circumstances, cell rupture probably occurs because the cell walls are unable to withstand the expansion that occurs during the formation of a single large ice column within the cell.

If the freezing time is about 250 minutes, large, irregular masses of ice form between the cells, which then become dehydrated and compressed into clumps. The association of jagged ice and distorted cells is thought to cause damage to the cells when the fillet as a whole shrinks or expands with

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 ABSTRACTER: Martin Heerdt

FOOD VALUE OF FISH

EFFECTIVENESS OF PRESERVATION

IRRADIATION PRESERVATION

EFFECT OF ICE CRYSTALS AND RIGOR

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SO_2 and sulphites.--From 1500 to 3000 p.p.m. of sulfur dioxide (SO_2) is permitted in fruit pulps for jam. Only a small fraction of the total quantity of SO_2 that is present is actually effective as an anti-microbial agent. SO_2, as sulfurous acid, enters into an equilibrium combination with aldehydic sugars, notably glucose, but not with fructose or sucrose. In this sulphonate form the anti-microbial activity of SO_2 is negligible, and much larger quantities are needed in confectioners' glucose than in corresponding sucrose syrups.

Nitrite.--Comparatively recently, the addition of up to 200 p.p.m. of sodium or potassium nitrite to cured meats has been permitted. In these products, similar or even greater concentrations may develop "naturally." The addition of nitrite is believed to give better control of the characteristic red color of nitromyoglobin. At a pH near 5.7, which cured meats often attain, small concentrations of nitrite are inhibitory. At acidities greater than pH 5.5, however, the nitrous acid disappears too rapidly to be useful, presumably by reaction with amino compounds, so that a pH near 5.6 is regarded as optimal. With free access of air, several times more nitrite is needed to produce the same bacteriostatic effect that is achieved without air.

New preservatives.--Sodium diacetate and propionic and sorbic acids, which recently have been permitted in Canada and in the U.S.A., are relatively free from objection on toxicological grounds. Some diacetate up to a maximum of 3000 p.p.m. and propionic acid up to 2000 p.p.m. or its salts are used in baked products to prevent rope in bread. In British tests, propionic acid was considerably more effective than diacetate against molds. Sorbic acid is permitted (1) at a level of 1000 p.p.m. in fruit produced in Canada and (2) in cheese wrappers in the U. S. A. It is effective primarily against fungi and some yeasts. A need exists for preservatives that are equally effective in near-neutral foods such as meat and fish. Benzoate esters are about as effective against various microorganisms as are equivalent quantities of undissociated acid; but the esters, unlike the acid, do not dissociate as the pH is raised, so that much the same concentration remains effective at different levels of pH.

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a change in temperatures.

In each of these three cases, the cell walls appear to have been damaged mechanically. This conclusion is supported by the presence of mitochondria--comparatively large intracellular components--in quantity in the expressed fluid. If the freezing time is about 1000 minutes, however, no evidence of mechanical damage appears, although the expressed fluid, which mainly arises from between the cells after thawing, did contain more protein than was expected. Apparently, some chemical damage to the cell wall had occurred through the solvent action of concentrated salt solutions temporarily formed by the removal of water as ice.

Freezing Before Rigor Mortis

A study of cod frozen before rigor mortis had set in was outlined because such a product is known to lose acceptability as an article of food after being thawed. Loss of acceptability in prerigor cod is caused by discoloration, exudation of drip, and a change in the texture.

Cod caught in a trawl net near the Faroe Islands by the research vessel Sir William Hardy were frozen as fillets at different speeds before the onset of rigor. The fillets then were transferred into cold storage at the end of the trip, and a study of their properties was initiated.

A histological study of the frozen tissue showed (1) that the ice crystals within the cells of prerigor cod were smaller than those in the controls, or postrigor cod, and (2) that the rate of the growth of ice crystals was slower in the prerigor muscle tissue than in the postrigor muscle tissue. Fillets frozen prerigor suffered much less cell damage, as measured by the DNA method, at all of the rates of freezing examined than did fillets frozen postrigor. The postrigor controls, for example, showed the usual maximum damage at a freezing time of about 100 minutes, whereas the prerigor fillets showed no sign of this damage.

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The amount of thiamin, riboflavin, and niacin destroyed when the fish was cooked appeared to depend on the temperature used and on the thickness of the flesh of the fish sample. More of the three vitamins were retained in the baked fish than in the pan-fried fish. Riboflavin retention in pan-fried fish was higher than the retention of niacin or of thiamin. Only 50 percent of each of the three vitamins was retained in the fish fried in deep fat. The percentage retention of thiamin and of niacin in canned fish was small.

Some change in the amino acid content of fried fish was found. The percentage of leucine, lysine, phenylalanine and valine was a third less in the protein of the fried fish. There was a significant loss in isoleucine, also. The change in the percentage of methionine and threonine in the fried fish was not significant.

Thirty-seven references are included.

3.19 (Cross Reference: 3.12)

The best results were obtained with cod and lemon sole that were irradiated in the frozen state with a dosage of 0.5×10^6 rads or unfrozen at 0.25×10^6 rads.

Effect of irradiation on storage.--In the second experiment, which was designed to test the efficiency of irradiation as a method of preservation, only cod were used. Fresh North Sea codling that had been in ice no longer than 1 day were filleted, cut in pieces of approximately 3 by 4 inches, placed in polyethylene bags, and sealed. The packaged fillets were kept for 24 hours in ice, irradiated with gamma rays from a cobalt 60 source, and held in ice for a further 24 hours. Some fillets were dipped in a solution containing 20 p.p.m. chlortetracycline (CTC) for 30 minutes before being packaged in order to test the combined effect of irradiation and antibiotic on preservation. The unirradiated controls consisted of normal and CTC-dipped fish. The four batches of irradiated fish consisted of fillets treated at doses of 1.0, 0.5, and 0.25×10^6 rads and CTC-dipped fish at doses of 0.25×10^6 rads. Each batch was divided into two lots. One lot was stored along with the appropriate controls at room temperature, and the other with controls at 0° C. All samples were examined bacteriologically, chemically, and organoleptically at regular intervals.

After 2 days of storage at room temperature only, the CTC-treated fish and those subjected to 0.25×10^6 rads were considered edible by the taste panels.

With regard to the samples stored at 0° C., the control sample of fish as well as the sample that had been irradiated at 1×10^6 rads was inedible on the 9th day of storage, and by the 23rd day, only the CTC-treated sample (with and without irradiation) was considered edible by the taste panel.

3.230 CALCULATING FREEZING TIME OF FISH IN AIR-BLAST FREEZERS

Levy, F. L.
Journal of Refrigeration 1, No. 3, p. 55 (March-April 1958)
World Fisheries Abstracts 10, 31-32 (March-April 1959)

The majority of fish-freezing plants have to be designed for varying conditions such as throughput and individual weights of fish. For calculating the freezing time, freezing speed, and refrigerating capacity required, certain characteristic dimensions of the fish must be known. The author has resolved these factors with equations and diagrams and discusses the variation of freezing time with the weight of the fish. From investigation of the relationship between what he calls the equivalent diameter of the fish and W, its individual weight, he concludes that $\frac{W^{\frac{4}{9}}}{a} = Ca$ where a is the maximum thickness and Ca is a constant depending on the species.

The relationship between W and L was found to be $\frac{W^{\frac{13}{36}}}{L} = C_L$, C_L being a constant depending on the size of fish.

The relationship between weight and dimensions are given in a table.

The relation between speed and heat transfer and air speed and freezing time are discussed, and a numerical example is worked out, which shows that no practical advantage is gained by increasing the air velocity to above 10 ft./sec. (3 m./sec.).

The size of a freezing chamber or tunnel cannot be determined by throughput figures alone. The

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Reprinted in part

3.332 EXPERIMENTS IN COOKING SARDINES--II.

Meesemaecker, R. and Sohier, Y.
Food Manufacture 34, 193-196, 204 (May 1, 1959)

Introduction.--In this article is described the cooking of sardines in hot air, in steam, and in two different media successively; general rules of cooking are enumerated.

Cooking in hot air.--Losses of weight on cooking in hot air, whether on grills or in the can, increase with the temperature and with the cooking time. The volume of exudate in the covering oil in the canned product decreases under the same conditions. Sardines treated in hot air at a high temperature could be insufficiently cooked in the center and, at the same time, show signs of degradation of surface proteins. Comparison of weights of exudate from cooking on grills with those from cooking in cans shows the relative slowness of cooking in cans.

Cooking in steam.--Examination of losses of weight on cooking in steam shows that cooking in cans is 15 minutes behind cooking on grills, as is shown below:

Losses of weight on cooking in steam at 100° C.

	15 min.	30 min.	45 min.	60 min.
	Percent	Percent	Percent	Percent
On grills	23.5	26.8	27.2	28.6
In cans	20.3	23.1	26.9	27.5

A much longer cooking is required for lean sardines than is required for fatty ones to avoid

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ABSTRACTER: June H. Olden

3.330 CANNING

Anonymous
Food Investigation 1957, Report of the Food Investigation Board (Great Britain), pp. 20-22 (1958) (London)

Canning.--Studies for improving the quality of canned herring with regard to flavor and texture are being carried out at the Torry Research Station by the British Food Manufacturing Industries Research Association. The minor extractives that largely are responsible for odor and flavor in both raw and cooked herring flesh will be the subject of this study.

Fresh fish flesh contains a number of nitrogenous extractives of which creatine, trimethylamine oxide, histidine, and taurine are the most abundant. Glycine, alanine, lysine, leucine, threonine, valine, glutamic acid, and serine also are present, but in smaller quantities. Small quantities of glucose and a trace of trimethylamine are present; ribose appears some time after death.

A study of the seasonal variations in some of the extractives mentioned above is being carried out on fish caught on a variety of fishing grounds during different times of the year. Incomplete results from this survey suggest that differences in the trimethylamine oxide content of Norwegian herring also occur in British herring, the amount present being considerably higher in winter than in summer.

Little is known of the nature of the changes that occur in fish flesh during cooking; therefore, some of these changes were followed in herring flesh cooked at 248° F. in sealed glass tubes. Total extractable nonprotein nitrogen was found to increase. This suggests an increased availability of nitrogenous components of low molecular weight. An increase in volatile bases as determined by gas

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ABSTRACTER: Martin Heerdt

4.20 THE FUNGICIDAL ACTIVITY OF THE UNSATURATED FATTY ACIDS AND QUATERNARY SALTS PREPARED FROM FISH OILS

Sokoloff, Boris; Toyomizu, Masamichi; Trauner, Walter; and Renninger, George (Florida Southern College, Lakeland)
Journal of the American Oil Chemists' Society 36, 234-237 (June 1959)

Purpose.--In the present study, the authors investigated the fungicidal activities of (1) unsaturated fatty acids obtained from fish oils and (2) the quaternary salts of unsaturated fatty acids obtained from fish oils.

Experimental.--A method of twofold dilution, with Sabouraud's peptone dextrose medium at the pH 6.1, was the most satisfactory and reliable test method. The fatty acids and fatty acid fractions were emulsified with 0.6 milliliters (ml.) of Tween 20, 0.3 ml. of propylene glycol, and 9.1 ml. of Sabouraud's medium. Their activity was tested by inoculating one drop of the suspension of a fungi culture into 5 ml. of the mixture that contained various degrees of dilution of the fatty acids. The antifungal activity of the material was expressed as the minimum amount of sample needed for a complete inhibition of growth of the test organisms. The following materials were tested against Candida albicans: (a) caproic acid, undecanoic acid, myristic acid, and palmitic acid, (b) oleic acid, linoleic acid, linolenic acid, and 10-henedecenoic acid; (c) methyl 10-hendecenate, 10-hendecenyl alcohol, and ethyl undecylate; and (d) ten unsaturated fatty acid fractions and ethyl esters of unsaturated fatty fractions from fish and vegetable oils.

Results.--Undecanoic acid, 10-hendecenyl alcohol, and 10-hendecenoic acid possessed the highest activity and inhibited the growth of Candida albicans in a concentration of 0.02 percent. Similar but not identical results were obtained by testing the fatty acid compounds on Aspergillus niger

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ABSTRACTER: Martin Heerdt

FREEZING TIME CALCULATIONS

CANNING

COOKING SARDINES

FATTY ACIDS AS FUNGICIDES

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chromatography was shown to be caused by ammonia, dimethylamine, and trimethylamine. Trimethylamine oxide and histidine were lost during cooking. Creatine was partly converted to creatinine; however, the amount of creatine plus creatinine showed an overall loss.

Preliminary investigations into the post-mortem changes that occur in herring flesh indicated that both trimethylamine and dimethylamine increase as the fish spoils.

Consideration is being given to the development of an objective method for assessing the texture of herring flesh. This is a necessary first step in an investigation into methods for improving the texture of the canned fish.

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and Rhyzopus nigricans. 10-Hendecenoic acid inhibited the growth of Aspergillus niger at 0.16 percent and the growth of Rhyzopus nigricans at 0.02 percent. Caproic acid arrested the growth of these fungi at 0.04 percent. Myristic acid was active against Aspergillus niger at 1.28 percent and against Rhyzopus nigricans at 0.16 percent concentration. Oxidation of the highly unsaturated fractions from pilchard and menhaden oils and the ethyl esters of unsaturated fatty acid fractions of menhaden, pilchard, and cod-liver oils by bubbling oxygen into them in the presence of M/100 Cu-stearate at 100° C. for 5 hours provided an increase in their antifungal activity.

Derivatives from fish oil. -- The saturated quaternary compounds prepared and evaluated were tetradecyltriethylammonium bromide, hexadecyltriethylammonium bromide, octadecyltriethylammonium bromide, tetradecylpyridinium bromide, hexadecylpyridinium bromide, and octadecylpridinium bromide. The unsaturated quaternary compounds prepared and evaluated were triethylammonium bromides obtained from the C-1, C12, and C13 bromide fractions of calamary-liver oil; pyridinium bromides obtained from the C-1, C-2, and C-3 bromide fractions of calamary-liver oil; and the M-1, M-2, M-3, and M-4 fractions of menhaden oil.

Results with derivatives. --Both hexadecyltriethylammonium bromide and hexadecylpyridinium bromide showed similar activity against Candida albicans and against Aspergillus niger and Rhyzopus nigricans. Candida albicans and Rhyzopus nigricans were inhibited at a concentration of 0.16 milligrams (mg.) percent by the saturated quaternary compounds, whereas Aspergillus niger was inhibited at a concentration of 1.28 mg. percent. The unsaturated quaternaries from fish oils gave similar inhibition. The C_{16} saturated quaternary compounds were more active than were the C_{14} and C_{18} compounds. Unsaturated quaternary compounds prepared from C-1 and M-1, the lowest boiling-point fractions, possessed a milder activity than did those prepared from fractions C-2 and C-3 or M-3 and M-4. As a group, the quaternary compounds possessed an antifungal activity much higher than that of the unsaturated fatty acids. The most active fatty acid, undecylic acid, inhibited the growth of Candida albicans at a concentration of 0.02 percent, whereas the most active quaternaries inhibited the growth of the same fungus at 0.32 mg. percent or at a concentration 600 times smaller.

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individual weights of the fish are an important factor to be considered in obtaining the highest possible all year round utilization and at the same time avoiding high peak loads on their refrigerating plant.

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abnormal quantities of exudate in the oil covering the canned fish.

Cooking in two media. -- When two different media are used successively, the first is usually boiling water, brine, or steam; and the second is always hot air, the use of which is called "drying."

General rules of cooking. -- The authors have established several essential principles regarding the cooking of sardines:

1. During cooking, sardines lose 20 to 30 percent of their weight, which loss increases with temperature and time of cooking and varies inversely with the fat content of the fish.

2. Cooking time for sardines depends mainly on the fatty condition of the fish, lean sardines requiring much longer than do fat sardines.

3. The water of composition that is not eliminated by sufficient cooking of canned sardines in oil is found in the covering oil after sterilization of the contents of the can in a retort.

4. Since the presence of a noticeable quantity of aqueous exudate in the covering oil in canned sardines signifies inadequate cooking of the fish, the time of cooking can be controlled by measuring the water in the drained oil.

5. Although drying in hot air in addition to cooking is unnecessary if the sardines have been sufficiently cooked, drying of sardines after they have been cooked in steam facilitates handling of the cooked fish and improves the final appearance of the product.

6. Sardines lose about 10 percent of their dry matter and 5 to 8 percent of their calorific value during cooking in steam.

7. In general, cooking does not appreciably decrease the fat content of sardine muscle.

3.5 THE INFLUENCE OF GIBBING ON THE RIPENING OF MAATJES CURED HERRING

Luijpen, A. F. M. G. (Jacob Catslaan 28, Driehuis (Velsen), The Netherlands)
De Invloed Van Het Kaken Op De Rijping Van Gezouten Maatjesharing, 91 pp. (1959) (Utrecht, The Netherlands) (English summary)

In the few publications which deal with the reactions that occur during the ripening of salted herring, there is no unanimity about the part played by proteolytic enzymes.

After a description in Chapter I of the way in which maatjes herring have been cured for centuries aboard the Dutch fishing ships, a survey is given in Chapter II of the methods of analysis used in the course of the investigations. The most important of these were the determinations of the activity of the endopeptidases by the method of Anson and of the activity of the exopeptidases by the method of Grassmann and Heyde.

Using these methods, an investigation, described in Chapter III, was set up into the existence of proteolytic enzymes in the muscles and intestines of the herring. In freshly caught maatjes herring, the trypsin in the pyloric caecae makes the most substantial contribution to the total endopeptidase activity, as measured at the pH values normally found in herring brines. Although considerable quantities of pepsin are present in the stomach, the activity of this enzyme in the pH range of herring brines is of little importance. The activities of the kathepsins in the liver and in the muscles are negligible compared with those of the endopeptidases in the intestines. This is not true for the exopeptidases of the muscles, however. The total amounts of dipeptidase and aminopeptidase are greater in the muscles than in the intestines. The carboxypeptidase activity is chiefly concentrated in the pyloric caecae.

Chapter IV deals with experiments showing the influence of sodium chloride on the activities of

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Author's summary

7.80 OBJECTIVE AND SUBJECTIVE ASSESSMENTS OF FISH QUALITY

Shewan, J. M. and Liston, J. (Torry Research Station, Aberdeen, Scotland)
Bulletin of the International Institute of Refrigeration, Supplement, Annex 1, pp. 137-147 (1956) (Cambridge, England)

Researchers at the Torry Research Station in Aberdeen, Scotland, for a number of years have been studying the pattern of spoilage of iced white fish including haddock and cod. The progress of spoilage from absolute freshness to putridity was followed by bacteriological, chemical, and organoleptic methods.

Organoleptic technique.--The organoleptic technique is an intrinsically valuable tool, and its use makes it possible to compare quality as judged by the trade, the processor, the merchant, and the consumer. The method used at the Torry Station involves the use of a trained panel, the individual members of which independently assess six important quality factors: general appearance, odor, and texture of the raw fish and odor, flavor, and texture of the cooked fish. The method is based upon the theory that by describing sensory phenomena precisely and avoiding preference and value judgments, the maximum information can be obtained. Statistical analyses have shown that with a properly trained taste panel, a remarkable degree of accuracy can be obtained and that the method possesses a fair degree of objectivity.

In the overall picture of the spoilage process there appears to be three points where major change occurs in the spoilage characteristics. This gives rise to four grades of quality that correspond in North Sea cod to: 0 to 7, 7 to 10, 11 to 15, and more than 15 days in ice. On the market, fish usually are graded by merchants and buyers into categories corresponding to the purpose for which they are to used. These are (1) freshing, (2) smoking, (3) salting, and (4) fish-meal production. These four categories approximate the four grades discerned by the taste-panel method.

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ABSTRACTER: Kathryn L. Osterhaug

6.190 NEW FISH MEAL TESTED IN BROILER RATIONS

Day, Elbert J. and Hill, James E (Mississippi Agricultural Experiment Station, State College)
Poultry Science 38, 556-559 (May 1959)

Introduction.--The high biological value of fish meals for use in poultry rations has been recognized for many years. Sardine, menhaden, and herring meals have been shown to have high gross protein values, whereas salmon, dogfish, tuna, and shark meals or meals made from fish waste or less than the whole fish have somewhat lower values (Rhian 1941, Robertson et al. 1940, and Almquist 1957). Properly processed fish are believed to provide the most complete source of amino acids available for poultry rations (Almquist 1957). Many workers have confirmed the early reports of Heuser and Norris (1951) and of Atkinson and Couch (1951), who found that fish meal and fish by-products contain unidentified factors that are important in poultry ration formulation.

Croaker meal.--Shrimp trawls in the Gulf Coast area catch about 80 percent fish and 20 percent shrimp.

About 98 percent of the fish is a species called croaker (Micropogon undulatus) that are suitable for use in making fish meal. Facilities capable of producing 18,000 tons of fish meal annually are now in operation in the Gulf Coast area. This study was conducted to compare the value of whole croaker meal with that of Angolan sardine and menhaden meals for use in broiler rations.

Experimental.--A supply of whole croaker and Angolan fish meal was obtained in December 1957 for the two trials. By analysis, the composition of whole croaker-meal was protein 63.1, fat 10.9, calcium 6.5, phosphorus 3.0, moisture 6.3, crude fiber 0.9, and ash 20.2 percent, respectively. This meal was made from whole fish that had been kept on ice until they were processed in a

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ABSTRACTER: Martin Heerdt

9.16 THE SIGNIFICANCE OF FISH CULTURE AS AN INTEGRAL PART OF RURAL ECONOMY IN INDONESIA

Ahjar, M. and Tasripin, R.
Proceedings Indo-Pacific Fisheries Council, 6th Session, September 30-October 14, 1955, Section II, pp. 303-306 (1956) (Bangkok)

The areas under fish culture in Indonesia at present are about 128,000 hectares of brackish water ponds; about 20,000 hectares of fresh-water ponds, and about 65,000 hectares of rice fields. About 15 million people, or 20 percent of the population, are engaged in the production of fish either as their main means of subsistence or as an important side line. At present, about 227 million kilograms of fish and about 8 billion fry are being produced.

The Regency of Tjiandjur, situated in the center of the province of West Java, is one of the areas where fish culture was introduced very early. Fish culture is conducted both in ponds and in rice fields. Although fish culture is only a secondary occupation for many people, some fish farmers raise fish as their only means of subsistence. This group consists mainly of pond owners who rear marketable fish or produce fish fry.

Not much risk is involved in cultivating fish in comparison with the cultivation of other products in Indonesia. Preventing the loss of water, manuring the pond or rice field, and stocking at the proper rate are the main problems faced by the fish farmers. Pests--such as birds, snakes, frogs, and crabs--can be minimized easily by regular control measures, and diseases occur infrequently.

Tabulated data on fish culture in the Regency of Tjiandjur appear (see over).

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ABSTRACTER: Kathryn L. Osterhaug

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steam-heated dryer at approximately 150° F. The sardine and menhaden meals were compared only on the basis of their protein content.

The basal ration used in both trials contained 50.6 percent yellow corn, 33 percent soybean oil meal, 5 percent vegetable oil, 3 percent corn gluten meal, 2 percent alfalfa meal, 2 percent dried whey, 2.6 percent bone meal, 0.7 percent limestone, and the following supplements on a per pound basis: 227 milligrams (mg.) choline chloride, 4 mg. riboflavin, 8 mg. pantothenate, 18 mg. niacin, 56.7 mg. 3-nitro-4-hydroxyphenylarsonic acid, 5.0 mg. zinc bacitracin, 65 mg. manganese sulfate, 0.045 mg. vitamin B_{12}, 3,632 International Units (I.U.) of vitamin A, and 545 I.U. of vitamin D_3. When this basal diet was modified to include fish meal, the protein, calcium, phosphorus, and energy levels of the rations were kept constant by varying the percentage of yellow corn, vegetable oil, soybean oil meal, bone meal, and ground limestone.

Duplicate groups of Cornish Cross chicks were randomly assigned to each modification of the basal ration by the addition of fish meal in one of the following amounts: 2.39 percent menhaden, 2.50 percent croaker, 2.31 percent sardine, 4.78 percent menhaden, 5.00 percent croaker, and 4.62 percent sardine. Feed and water were supplied ad libitum. Individual body weights and group feed-consumption records were obtained at 8 weeks of age and were analyzed statistically.

Results.--Both trials indicated that whole croaker fish meal is just as effective as menhaden or sardine meal when used to supply comparable amounts of protein in broiler rations. A significant growth response was obtained by the addition of either whole croaker, menhaden, or sardine meal to broiler rations in both trials. The lower supplementary level of fish meal, or about 2.5 percent, appeared to be as effective as higher levels, or about 5.0 percent, with all three meals. No differences were noted in the degree of pigmentation, finish, or feathering of the chicks that could be attributed to the source of fish meal.

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Weight and value of fry			Weight and value of edible fish		
Grown in ponds	Rice fields	Total value	Grown in ponds	Grown in rice fields	Total value
M.T.	M.T.	Rp.	M.T.	M.T.	Rp.
225,000	- -	562,500	30	1,950	15,840,000

M.T. = Metric ton or 1000 kg. Fry at 2.50 Rp. per thousand. Fish at 8 Rp. per kg.

Cost per hectare per year of rice-and-fish culture on farms is 3,200 Rp. for rice culture and 900 Rp. for fish culture, or a total of 4,100 Rp. Income is 4,300 Rp. from rice culture and 2,500 Rp. from fish culture, or a total of 6,800 Rp. Thus, the profit from the combined operation is 2,700 Rp. per hectare, whereas the profit from rice cultivated alone is only 1,100 Rp.

3.5

the enzymes. At salt concentrations that are normal in maatjes cured herring, the activities of the endopeptidases are still considerable. The activities of the exopeptidases are more strongly inhibited than those of the endopeptidases. Storage experiments with endopeptidase extracts containing sodium chloride show that initially the activity of the trypsin as well as that of the pepsin decreases rapidly, under the conditions of the experiment, but that ultimately the trypsin has the greater residual activity of the two. At temperatures usually encountered in herring cold stores, differences of a few centigrade degrees have little influence on the velocities with which the activities of the enzymes decrease.

In Chapter V the changes in the activities of the endopeptidases during storage of maatjes cured herring are described, as well as the changes the herring itself undergoes because of the enzyme action. The results show that the trypsin activity of the brine passes through a maximum, and appears to be but little dependent on the storage temperature, within the limits investigated. Organoleptic testing and determinations of tyrosine showed that the velocity with which the herring was ripening was markedly influenced by temperature.

When gibbing herring in practice, not always the same parts of the fish are cut away, so that the proportions of the proteolytic enzymes in the barrels are not constant. Hence the proportions can also be changed intentionally by varying the usual gibbing procedure. The results of the storage experiments with maatjes cured herring, gibbed in different ways as described in Chapter VI, prove that Liebert was right in stating that the presence of pyloric caecae was necessary for the development of the desired organoleptic properties of salted herring. Maatjes herring gibbed in such a manner that the pyloric caecae were cut away, either alone or together with the stomach, resulted in an inferior product after storage in the cured condition.

Chapter VII deals with attempts to find out whether the trypsin is secreted in the pancreatic tissue that grows like a network over the pyloric caecae, or directly in the caecae themselves. Application of biochemical methods gave no decisive answer to this question. The same methods applied to the intestines of perch showed that the mucous membrane of the caecae had no pancreatic function, but was closely related to the mucous membrane of the long gut. Examination of microscopic preparations proved that the structures of, on the one hand, the caecae of perch and herring, and on the other, the pancreatic tissue growing over the caecae of both species were highly analogous.

7.80 (Cross Reference: 2.01, 2.03)

Bacteriological changes.--Some of the earliest nonsensory methods of assessing the quality of fish involved the estimation of bacterial numbers. It is possible, however, that it is not the total bacterial population that primarily is responsible for spoilage, but rather it is the "active" flora. Analyses therefore have been made of the changing pattern of the associated bacterial flora during the spoilage of cod in ice.

In freshly caught cod, over 90 percent of the flora consists of asporogenous gram negative rods; Pseudomonas and Achromobacter species each represent 40 percent of the flora, and the remainder consist of Flavobacterium, Coryneforms, Cocci, and others. As the spoilage proceeds, the flora alters and proportion of Pseudomonas increases up to the 10th or 12th day, when a slight regression occurs and Flavobacterium increase correspondingly. After this the Psuedomonas species increase until at the end of the spoilage period (21 days) they constitute almost 90 percent of the total viable population.

Chemical changes during spoilage.--In addition to studying sensory and bacteriological changes, the Aberdeen workers have been following some of the chemical changes that take place in fish during spoilage--particularly changes in the muscle extractives. The extractives in freshly caught cod muscle consist of creatine and creatinine; trimethylamine oxide; taurine; anserine; various amino acids, purines, and purine derivatives; as well as carbohydrates such as glucose and glycogen. During autolysis, none of the major constituents except anserine undergoes any change. Anserine is broken down by muscle anserine to 1-methyl histidine and β-alanine. Of the remaining amino acids, alanine and lysine disappear, glycine is unchanged, and glutamic acid increases considerably in amount. Glucose, and probably glycogen, disappears completely by the 5th to 10th day, whereas ribose, which is absent in freshly caught fish, increases steadily as a result of muscle ribosidases.

Theoretically it should be possible to use any of these chemical changes as an index of spoilage. Many of these changes, however, are unsuitable because they do not satisfy the following three major conditions governing their use for this purpose: (1) the chemical compound should either be absent or in constant amount in fresh fish, (2) it should accumulate or disappear at a steady rate during spoilage, and (3) it should be capable of being estimated speedily and simply. Only three or four substances satisfy these criteria, including trimethylamine and total volatile bases.

0.32 INFLUENCE OF UREA UPON THE BINDING OF SOME IONIC DYES TO PROTEINS

Migita, Masao and Otake, Shigeo
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 8, 663-670 (1958) (English abstract, figures, and tables)

Equilibrium dialysis verified (1) the inhibiting effect of urea on the interaction between serum albumin and methyl orange, (2) the splitting effect of urea on the preformed combination between serum albumin and methyl orange, and (3) the influence of urea upon the binding of methyl orange and methylene blue to fish actomyosins.

0.32 POLAROGRAPHIC STUDIES OF PROTEIN CONTAINED IN AQUATIC ANIMAL II. SPECIFIC DIFFERENCE SHOWN IN PROTEIN WAVE

Kikuchi, Takeaki; Hirano, Toshiyuki; Morooka, Hiroshi; and Okada, Ikunosuke
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 8, 651-655 (1958) (English abstract and figures)

With increasing concentration of protein, the height of the protein wave first increased proportionally to protein concentration but tended finally to a plateau.

0.33 MULTIPLE HEMOGLOBINS IN FISH

Hashimoto, Kanehisa and Matsuura, Fumio (Faculty of Agriculture, University of Tokyo)
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 9, 719-723 (1959) (In English)

0.33 COMPARATIVE STUDIES ON TWO HEMOGLOBINS OF SALMON

Hashimoto, Kanehisa and Matsuura, Fumio (University of Tokyo)
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 9, 724-729 (1959) (In English)

0.33 CHEMICAL STUDIES ON THE RED MUSCLE ("CHAI") OF FISHES--IX. HEAT COAGULABILITY OF RED MUSCLE MYOGLOBIN AND BLOOD HEMOGLOBIN

Matsuura, Fumio; Hashimoto, Kanehisa; and Haruta, Naohisa
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 9, 730-734 (1959) (English abstract and figures)

0.33 A COMPARATIVE STUDY ON THE EXTRACTABILITY OF MUSCLE PROTEINS OF SOME ANIMALS

Migita, Masao; Matsumoto, Juichiro J.; and Aoe, Norimichi (Tokai Regional Fisheries Research Laboratory)
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 9, 751-759 (1959) (In English)

0.38 STUDIES ON THE SUCCINIC DEHYDROGENASE OF FISH V. DIFFERENCE OF SUCCINIC DEHYDROGENASE ACTIVITY BETWEEN VARIOUS FISHES AND FISH ORGANS

Fukuda, Hironari
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 1, 24-28 (1958) (English abstract and tables)

The succinic dehydrogenase activity of the pelagic fish was higher than that of the other non-pelagic fish and fresh-water fish. The E-values for the pelagic fish were as follows: 100 ~ 40 in dark meat, 50 ~ 30 in liver, 25 ~ 15 in kidney, 16 ~ 8 in gill, and 10 ~ 5 in ordinary meat. The E-values for nonpelagic fish were as follows: 24 ~ 16 in liver, 14 ~ 2 in kidney, 13 ~ 1 in gill, and 5 ~ 1 in ordinary meat. These data indicate that oxidative reductive metabolism is highly active in the dark meat and liver of pelagic fish and that these tissue enzymes may be intimately connected with their migratory habits.

0.38 STUDIES ON THE BIOCHEMICAL CHANGE IN FISH MUSCLE--IX. ON THE PROTEOLYTIC ACTIVITY OF ORDINARY AND DARK MUSCLE

Saito, Kaname and Sameshima, Muneo
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 8, 648-650 (1958) (English abstract, table, and figure)

Proteolytic activity of dark muscle was stronger than that of ordinary muscle and the amount of free tyrosine in the process of autolysis of dark muscle increased far more rapidly than in the case of the ordinary muscle.

1.953 CRYSTALLINE WHALE PEPSIN. I. ISOLATION AND PURIFICATION

Saito Tsuneyuki and Ishihara, Yoshio (Hokkaido Univ., Sapporo)
Nippon Kogei-kagaku Kaishi 30, 426-31 (1956)
Chemical Abstracts 51, 18035 (November 25, 1957)

Crystalline pepsin was isolated from several species of whales.

1.953 TREATING AND PROCESSING OF WHALE MEAT TO MEAT PRODUCTS

Roemmele, Otto (Staatl. Vet. Untersuchungsamt, Braunschweig, Ger.)
Fleischwirtschaft 10, 833-5 (1958)
Chemical Abstracts 53, 10585h (June 10, 1959)

Meat for human consumption should be frozen (-6° to -10°) and exposure to air should be avoided. After thawing the pH should be 5.6 to 6.4. The characteristic natural flavor can be masked by the use of spices. Extreme fishiness occurs only after improper handling. Histological identification of deep-frozen whale meat in a mixture with other meat is possible.

GLOSSARY OF COMMON AND SCIENTIFIC NAMES OF FISH AND SHELLFISH*

Common name	Other common names	Scientific name
Alewife	Branch herring, big-eyed herring, river herring,	Pomolobus pseudoharengus
	Blueback, glut herring, shad herring	Pomolobus aestivalis
Anchovy		Engraulis mordax
Cod	Codfish	Gadus morhua (Atlantic)
		Gadus macrocephalus (Pacific)
Flounder:		
Gray sole		Glyptocephalus cynoglossus
Lemon sole		Pseudopleuronectes dignabilis
Yellowtail	Dab	Limanda ferruginea
Dab	Sea dab	Hippoglossoides platessoides
Blackback	Winter flounder	Pseudopleuronectes americanus
Fluke	Summer flounder, gulf flounder, flounder	Paralichthys species
'Sole'		Pleuronectidae and Bothidae species
'California halibut'		Paralichthys californicus
Haddock		Melanogrammus aeglefinus
Halibut		Hippoglossus hippoglossus (Atlantic)
		Hippoglossus stenolepis (Pacific)
Herring:		
Lake	Herring	Leucichthys artedi (Great Lakes, except Erie)
Round		Etrumeus sadina
Sea		Clupea harengus (Atlantic)
		Clupea pallasii (Pacific)
Thread		Opisthonema oglinum
Jack mackerel	Horse mackerel	Trachurus symmetricus
Lingcod	Cultus cod, blue cod, buffalo cod, ling	Ophiodon elongatus
Mackerel		Scomber scombrus (Atlantic)
		Pneumatophorus diego (Pacific)
Crab:		
Blue		
Hard	Hard-shelled crab	Callinectes sapidus
Soft and peelers	Soft-shell crab	Callinectes sapidus
Dungeness		Cancer magister
King	Alaska king crab	Paralithodes camtschatica
Rock		Cancer irroratus (New England)
		Cancer species (California)
Stone		Menippi mercenaria
Lobster:		
Northern		Homarus americanus (Atlantic)
Spiny	Sea crawfish, rock lobster	Panulirus argus (Atlantic)
		Panulirus interruptus (Pacific)
Shrimp	Prawn	Penaeus setiferus (South)
		Penaeus duorarum (Atlantic)
		Penaeus aztecus and Xiphopeneus kroyeri (Gulf)
		Pandalus species (Atlantic and Pacific)
		Pandalopsis species (Pacific)
		Crago species (Pacific)
Menhaden	Mossbunker, pogy, fatback	Brevoortia species
Mullet	Jumping mullet, striped mullet, silver mullet	Mugil species
Ocean perch:		
Atlantic	Rosefish, redfish, red perch	Sebastes marinus
Pacific		Sebastodes alutus
Pilchard	Sardine	Sardinops caerulea
Pollock	Boston bluefish	Pollachius virens
Rockfish	Rock cod, snapper	Sebastodes species (Pacific)
Sablefish	Black cod	Anoplopoma fimbria
Salmon:		
Atlantic		Salmo salar (Atlantic)
Pacific:		
Chinook or king	Tyee, spring	Oncorhynchus tshawytscha
Chum or keta	Fall, dog	Oncorhynchus keta
Pink	Humpback	Oncorhynchus gorbuscha
Red or sockeye	Blueback	Oncorhynchus nerka
Silver or coho		Oncorhynchus kisutch
Spanish mackerel	Mackerel	Scomberomorus maculatus
Tuna and tunalike fishes:		
Albacore	Longfin tuna	Germo alalunga
	---	Thunnus saliens
Bluefin	Horse mackerel	Thunnus thynnus
	---	Thunnus secundodorsalis
Bonito		Sarda sarda (Atlantic)
		Sarda chiliensis (Pacific)
Little	Bonito, albacore, false albacore	Euthynnus alletteratus
Skipjack	Striped tuna	Katsuwonus pelamis
Yellowfin		Neothunnus macropterus
Whiting	Silver hake	Merluccius bilinearis
Clam:		
Cockle		Cardium corbis (Pacific)
Coquina	Pompano shells	Donax variabilis
	Butter	Saxidomus nuttali (Pacific)
Hard	Little neck	Paphia staminea (Pacific)
	Round clam, cherrystone, quahog, little neck	Venus mercenaria (Atlantic)
		Venus mortoni (Florida)
Ocean quahog		Cyprina islandica
Pismo		Tivela stultorum (Pacific)
Razor		Ensis species (Atlantic)
		Siliqua patula (Pacific)
Soft	Soft-shell clam, sand clam, nannynose, maninose	Mya arenaria
Surf	Skimmer	Spisula solidissima
Oyster:		
Eastern	Cove	Crassostrea virginica
Pacific (introduced)	Japanese	Crassostrea gigas
Western	Olympia, native	Ostrea lurida
Scallop:		
Bay		Pecten irradians (Atlantic)
		Pecten aequisulcatus (Pacific)
Sea		Pecten magellanicus

* Taken from Fishery Statistics of the United States 1955. Each species listed was caught in excess of 10,000,000 pounds in 1955.

2.01 BACTERIOLOGY

Anonymous
Food Investigation 1957, Report of the Food Investigation Board (Great Britain), pp. 22-23 (1958)

(Abstract of this article appears under 0.5 page 1 - September 1959)

2.01 TRIMETHYLAMINE OXIDE IN FISH MUSCLE I. THE ORIGIN OF TRIMETHYLAMINE OXIDE IN GOLDFISH MUSCLE

Hashimoto, Yoshiro and Okaichi, Tomotoshi (The University of Tokyo, Japan)
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 8, 640-644 (1958) (In English)

While goldfish were on a TMO-free diet consisting of carp meat and gelatin, the muscle of the goldfish was TMO- and TMA-free, but it retained a small amount of the base from the food for a short period. In the muscle of fish fed the oxide, TMA also appeared later, and this, together with other evidence, may suggest that some of TMO is reduced to TMA before being excreted.

II. Trimethylamine oxide in the muscle of eels kept in fresh and brackish water. --Ibid. 645-647. It is confirmed that trimethylamine oxide (TMO) in the muscles of eels is of exogenous origin. The chlorinity of the medium had no connection with the retention of the base. The metabolic rate of TMO in the eel muscle is assumed to be slightly different from that in the goldfish muscle.

2.112 HYDRODYNAMIC STUDIES ON THE RESISTANCE OF SPHERICAL GLASS FLOATS FOR FISHING NET II.

Taniguchi, Takeo
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 1, 16-18 (1958) (English abstract and figures)

The rate of increase of resistance due to the sheltering with net is proportional to the diameter of the netting cord. The drag coefficient varies considerably, within the range of small meshes, with the difference of meshes, but it is practically constant when the size of mesh exceeds 7.5 cm. The difference in drag coefficient owing to the kind of material of the shelter-net is insignificant.

2.112 ON THE DECREASE OF BUOYANT FORCE OF THE FLOAT II.

Igarashi, Shuzo
Bulletin of the Faculty of Fisheries Hokkaido University 9, 95-100 (August 1958) (English abstract)

A decrease in the buoyancy of a synthetic float is caused by a decrease in its volume.

3.12 INHIBITION OF BACTERIA FROM MARINE SOURCES BY AUREOMYCIN

Velankar, N. K.
Proc. Indian Acad. Sci. 47B, 87-96 (1958)
Chemical Abstracts 53, 1463i (January 25, 1959)

The effect of aureomycin on 50 bacterial species isolated from marine sources was studied at levels of 2, 5, 20, and 50 p.p.m. of the antibiotic. Of the bacteria, 70 percent were sensitive to at least 5 p.p.m. of aureomycin.

3.12 CHEMICAL PRESERVATIVES IN FOODS II. THE EFFECT ON MOLDS

Nikkila, Olavi E. and Linko, Reino R.
Maataloustieteelinen Aikakauskirja 30, 125-31 (1958) (In English)
Chemical Abstracts 53, 10581d (June 10, 1959)

The efficiency of various chemical preservatives against molds responsible for food spoilage was studied. The preservatives tested were dehydroacetic acid, benzoic acid, ethyl p-hydroxybenzoate, hexamethylenetetraamine, vitamin K_5, and sorbic acid.

3.29 FISH POISONING

Szabados, A.
Elelmez. Ipar. Budapest 9, 349-351 (1955)
Food Science Abstracts 29, 216 (June 1957)

3.29 NUTRITIVE VALUE OF CANNED MEAT

Sawant, P. L. and Magar, N. G. (Inst. Sci., Bombay)
J. Sci. Ind. Research (India) 17C, 189-91 (1958)
Chemical Abstracts 53, 10586f (June 10, 1959)

Canned fish was packed in hot peanut oil and stored at 27°, 37°, and 43° for 4 to 12 months. Soluble protein, amino acids, thiamine, riboflavine, and niacin all decreased; the changes were greater with longer time and higher temperature. The peroxide number of the muscle fat and of the covering oil increased after 4 months' storage.

LIST OF PUBLICATIONS REGULARLY ABSTRACTED

Analyst
Analytical Chemistry
Archives of Biochemistry and Biophysics
Biochemical Journal
Biochemistry (U.S.S.R.)
Bulletin of the Faculty of Fisheries, Hokkaido University
Bulletin of the Japanese Society of Scientific Fisheries
California Fish and Game
Canadian Fisherman
Canadian Journal of Biochemistry and Physiology
Canadian Journal of Chemical Engineering
Canadian Journal of Chemistry
Chemical Abstracts
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Chemistry and Industry
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Drug and Cosmetic Industry
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Feed Bag
Feedstuffs
Fish Boat
Fisheries Newsletter (Australia)
Fish. Res. Bd. Can., Prog. Repts. Atlantic Coast Stas.
Fish. Res. Bd. Can., Prog. Repts. Pacific Coast Stas.
Fishing Gazette
Food Engineering
Food Manufacture
Food Preservation Quarterly
Food Processing
Food Research
Food Technology
Frosted Food Field
Industrial and Engineering Chemistry
Industrial Refrigeration
Journal of Agricultural and Food Chemistry
Journal of Applied Chemistry
Journal of Biological Chemistry
Journal of Nutrition
Journal of the American Chemical Society
Journal of the American Dietetic Association
Journal of the American Oil Chemists' Society
Journal of the Association of Official Agricultural Chemists
Journal of the Fisheries Research Board of Canada
Journal of the Science of Food and Agriculture
Maine Coast Fisherman
Modern Packaging
Modern Refrigeration
National Fisherman
National Provisioner
Nature
Nutrition Reviews
Pacific Fisherman
Poultry Science
Progressive Fish-Culturist
Quick Frozen Foods
Refrigerating Engineering
Report of the Food Investigation Board (Great Britain)
Science
Seafood Merchandising
Trade News (Fisheries Department, Canada)
Western Canner/Packer
Western Fisheries
World Fisheries Abstracts
World Fishing

Articles chosen for abstracting or inclusion as bibliographical references are those deemed of interest to the commercial fisheries and to fishery technological laboratories. Occasionally pertinent articles from sources other than the above-listed publications are included. Biological papers are generally omitted.

3.335 (Cross Reference: 1.85)

THE MORECAMBE BAY POTTED SHRIMP INDUSTRY

Dewberry, Elliott B.
Food Manufacture 33, 355-357 (September 1958)

To every 10 pounds of shrimp meat, add 1 pound of butter and a suitable quantity of blended spices. Heat this mixture slowly in a deep, enamel-lined, covered kettle to bring the contents to boiling in about 35 minutes. Stir frequently and hold at boiling for 20 minutes. Strain the shrimp mixture into wire mesh baskets to remove surplus liquid, cool for 15 minutes, scoop into grease-proof wax cartons of 2-ounce capacity and cover with melted butter. Place a cellophane disk over the butter and press a printed lid onto the carton.

3.336 STERILIZER UPS CANNED-FOOD QUALITY

Robinson, Leslie (Mitchell Engineering Ltd., London, England)
Food Engineering 30, 60-62 (December 1958)

Retention of the natural color and form of fruits and vegetables is now being achieved with an improved continuous sterilizer that substitutes water columns for transfer valves, thus eliminating sudden changes in temperatures and pressures.

The sterilizer also features: great flexibility as to capacity and range of can sizes handled; economy of steam and water; and outstanding mechanical reliability.

4.13 EGG LIPIDS OF A SALMON, ONCORHYNCHUS KETA I. FATTY OILS FROM SALMON EGGS

Zama, Koichi; Katada, Muneo; and Igarashi, Hisanao
Bulletin of the Japanese Society of Scientific Fisheries 24, Nos. 6 and 7, 569-572 (1958) (English abstract, figure, and tables)

Unfertilized and 24-hour-old fertilized salmon eggs were repeatedly extracted with acetone. The acetone extracts were further treated with acetone to obtain fatty oils as acetone-soluble lipids. No difference was found between the lipids of these eggs. The percentage composition of the fatty acids of the fatty oil from unfertilized egg was as follows: saturated C_{14}, 4.8; C_{16}, 11.1; C_{18}, 3.5; and C_{20}, 0.5; unsaturated C_{14}, 0.2 (-2.0 H); C_{16}, 13.2 (-2.5 H); C_{18}, 36.2 (-3.0 H); C_{20}, 20.1 (-8.5 H); and C_{22}, 10.4 (-10.0 H).

4.13 INFLUENCE OF GONADAL DEVELOPMENT ON THE UNSATURATED FATTY ACIDS IN DEPOT FAT OF BALTIC HERRING

Meyer, Helmut (Univ. Kiel, Ger.)
Kiel. Meersforsch. 14, 151-66 (1958)
Chemical Abstracts 53, 9491g (May 25, 1959)

The fat content showed a direct relation with that of the fatty acids with 3 double bonds. From the data it appeared that during fat storage the lower unsaturated energy-rich fatty acids are stored, and that during gonadal ripening these are used.

4.15 COMPONENTS ACIDS OF INDIAN ELASMOBRANCH LIVER OILS

Kamath, G. G. and Magar, N. G. (Inst. Sci., Bombay)
J. Indian Chem. Soc. Ind. & News Ed. 18, 241-6 (1955)
Chemical Abstracts 52, 14976 (September 10, 1958)

Acids in Carcharias limbatus liver oil are 33.82 percent saturated and 66.17 percent unsaturated. Palmitic and stearic are the main saturated acids, while the unsaturated acids are 37.96 percent C_{18}, 16.68 percent C_{20}, and 7.08 percent palmitoleic acid. In Cestracion blochii liver oil saturated acids, mainly palmitic, comprise 25.5 percent of the total, 51 percent of total acid is C_{18} unsaturated, and 10 percent is palmitoleic acid.

4.15 UREA FRACTIONATION OF ELASMOBRANCH SHARK LIVER OILS. A COMPARATIVE STUDY OF FRACTIONATION WITH LEAD AND LITHIUM SALTS

Mehta, T. N.; Rao, C. V. N.; Rao, B. Y.; and Lokras, S. S. (Laxminarayan Inst. Technol., Nagpur)
Indian J. Appl. Chem. 21, 15-24 (1958)
Chemical Abstracts 53, 6655f (April 10, 1959)

Fractionation by the Pb-salt-alcohol and urea methods were compared on shark liver oils obtained from five species of sharks. The adducts formed soluble Pb salts containing mostly mono-unsaturated acids.

4.21 POLARGRAPHIC STUDIES ON THE RANCID OIL

Kikuchi, Takeaki; Okada, Ikunosuke; Osakabe, Isami; and Fukushima, Kiyoshi (Tokyo Univ. Fisheries, Kurihama)
J. Tokyo Univ. Fisheries 42, 39-63 (1956)
Chemical Abstracts 52, 21171i (November 25, 1958)

4.21 THE EFFECT OF DI- AND TRIETHANOLAMINE ON LIPOXIDASE OXIDATION OF LINSEED OIL

Araksyan, S. M.
Trudy Erevan, Zootekh.-Vet. Inst. No. 21, 21-3 (1957)
Referat. Zhur. Khim. Biol. Khim. Abstr. No. 31907 (1958)
Chemical Abstracts 53, 8231b (May 10, 1959)

Oxidation of linseed oil by the lipoxidase of soya beans was determined using Warburg apparatus at pH 6.5 and 38° C. Addition of tetraethanolamine somewhat enhanced the lipoxidase activity. Preliminary intermixing of amines with the enzyme preparation completely or partially depressed the oxidative process.

4.21 THE CATALYTIC ACTION OF BLOOD AND BLOOD PIGMENT ON THE OXIDATION OF UNSATURATED FATTY ACID AND HYDROCARBON

Shimizu, Chiaki and Fukuhara, Tadanobu
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 9, 760-764 (1959) (English abstract and figures)

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6.32 CHEMICAL STUDIES ON VOLATILE CONSTITUENTS OF SEAWEED. ON VOLATILE CONSTITUENTS OF DIGENIA SIMPLEX

Katayama, Teruhisa
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 3, 205-208 (1958) (English abstract and tables)

Volatile compounds found to exist in the steam distillate from Digenia simplex were: methylmercaptan; formic, acetic, propionic, butyric, and valeric acid; palmitic acid; benzaldehyde, α-methylfurfural, and furfural; p-creosol; and A-pinene, d-limonene, terpinolene, linalool, and gernaiol.

XIII. On volatile constituents of Laminaria sp. --Ibid. No. 5, 346-354. An attempt was made to clarify the difference in volatile constituents of chlorophyceae, rhodophyceae, and phaeophyceae and to determine the principle aromatic and odorous components of Laminaria sp.

6.32 STUDIES ON THE VITAMINS OF SEAWEEDS. I. FOLIC ACID AND FOLINIC ACID

Kanazawa, Akio and Kakimoto, Daiichi
Bulletin of the Japanese Society of Scientific Fisheries 24, Nos. 6 and 7, 573-577 (1958) (English abstract, figure, and tables)

Hydroclathrus clathratus yielded the largest amount of folic acid or 860 millimicrograms (mγ) per gram, whereas Endarachne binghamiae yielded the lowest value or 35 m. per gram. Ceramium tenerrinum yielded the highest amount of folinic acid or 930 m. per gram, whereas Ectocarpus indicus yielded the lowest amount, or 12 m. per gram.

6.35 CONNECTIVE TISSUE GROWTH STIMULATED BY CARRAGEENIN

Jackson, D. S. (Rheumatism Research Centre, University of Manchester, England)
The Biochemical Journal 65, 277-284 (February 1957)

1. The formation and removal of collagen. Subcutaneous injection of 1-percent carrageenin solution into guinea pigs stimulates the formation of new connective tissue, which is resorbed after 4 to 6 weeks.

6.35 FRACTIONATION OF GELOSES

Smith, David B. (to National Research Council, Canada)
Can. 561,448 (Aug. 5, 1958)
Chemical Abstracts 53, 9515a (May 25, 1959)

Geloses from red algae (Gigartinaceae), especially carrageenin, are fractionated by use of salts of NH_4, K^+, Rb^+, or Cs^+.

7.522 THE PROTEINS OF SHELLFISH II. PRETREATMENT OF PAPER IN PAPER ELECTROPHORETIC FRACTIONATION

Baba, Haruo
Ann. Rept. Natl. Inst. Nutrition (Toyko) pp. 39-40 (1957)
Chemical Abstracts 52, 14733 (September 10, 1958)

III. Muscle extracts of high ionic strength. --Ibid. 41-2

7.522 ADVANCES IN THE DETERMINATION OF AMINO ACIDS IN FEEDSTUFFS

Frampton, Vernon L. (Southern Regional Research Laboratory, New Orleans, Louisiana)
Feedstuffs 31, 18-20 (June 20, 1959)

Author's summary. --The chromatographic method for the determination of amino acids present in protein hydrolyzates is very good. The uncertainty in protein analyses, especially with feedstuffs where extraneous materials are present, develops because of the destruction of amino acids during the hydrolysis and because of the unequal rates of hydrolysis of the peptide bonds. The preparation of the amino acid solution by the hydrolysis of the protein should be given concentrated research attention in the immediate future.

8.51 COMPARISON OF DEOXYRIBONUCLEOPROTEINS ISOLATED FROM THE SPERMATOZOA OF SOME FISHES

Knobloch, Alice; Matsudaira, Hiromichi; and Vendrely, Roger
Compt. rend. 246, 2679-82 (1958)
Chemical Abstracts 52, 14877 (September 10, 1958)

Deoxyribonucleoproteins prepared from the sperm of some fish species were hydrolyzed and the amino acid composition of the hydrolyzate determined by paper chromatography.

8.51 THE C-TERMINAL AMINO ACID SEQUENCE OF GROWTH HORMONES FROM HUMAN, MONKEY, WHALE, AND SHEEP PITUITARY GLANDS

Li, Choh Hao; Parcells, Alan J.; and Papkoff, Harold (University of California, Berkeley)
Journal of Biological Chemistry 233, 1143-1145 (November 1958)

The authors found the following C-terminal amino acid sequences for growth hormones from several species: Sheep--alanine, leucine, and phenylalanine; whale (humpback)--leucine, alanine, and phenylalanine; monkey (Rheus, Macaca mulatta)--alanine, glycine, and phenylalanine; human--leucine and phenylalanine.

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